

CLAIMS

What is claimed is:

1 1. A hydrodynamic torque converter of the type comprising a pump
2 wheel and a turbine wheel, each said wheel comprising an outer shell, an inner shell,
3 and a plurality of vanes connecting said shells, each said vane comprising an inner
4 edge facing said inner shell and an outer edge facing said outer shell, each said shell
5 having at least one opening and a rear surface facing away from the vanes, each said
6 vane of at least the turbine wheel comprising:

7 at least one connecting element received through a respective at least one
8 opening in the inner shell and deformed against the rear surface of said inner shell to
9 fasten the vane to the inner shell; and

10 a plurality of connecting elements received through respective said
11 openings in the outer shell and deformed against the rear surface of the outer shell to
12 fasten the vane to the outer shell, wherein the number of connecting elements received
13 through openings in the outer shell exceeds the number of connecting elements
14 received through openings in the inner shell by at least two.

1 2. A hydrodynamic torque converter of the type comprising a pump
2 wheel and a turbine wheel, each said wheel comprising an outer shell, an inner shell,
3 and a plurality of vanes connecting the shells, each said vane comprising an inner edge
4 facing said inner shell and an outer edge facing said outer shell, each said shell having
5 at least one opening with a length and a rear surface facing away from the vanes, each
6 said vane of at least the turbine wheel comprising:

7 a plurality of connecting elements on said edges, said elements being
8 received through respective openings in the shells and deformed against the rear
9 surfaces of the shells to fasten the vanes to the shells, said connecting elements
10 comprising a first connecting element comprising a positioning segment, which extends
11 substantially the length of the respective opening, and a retaining segment, which
12 stands proud of said positioning segment but does not extend the length of the opening,
13 only said retaining segment being deformed against said rear surface.

1 3. A hydrodynamic torque converter as in claim 2 wherein said first
2 connecting element is located proximate to a radial end of the vane.

1 4. A hydrodynamic torque converter as in claim 3 wherein said
2 positioning segment extends closer to said radial end of said vane than said retaining
3 segment.

1 5. A hydrodynamic torque converter as in claim 2 wherein said
2 positioning segment does not stand proud of said rear surface of said shell.

1 6. A hydrodynamic torque converter as in claim 2 wherein said
2 positioning segment has a length which is greater than the length of a connecting
3 element which does not have a positioning segment and a retaining segment.

1 7. A hydrodynamic torque converter as in claim 2 wherein said
2 positioning segment has a first end and a second end, said retaining segment extending

3 from said first end, said second end abutting an end of the opening in which the
4 connecting segment is received.

1 8. A hydrodynamic torque converter as in claim 7 wherein said second
2 end abuts said end of said opening with a predetermined pretension.

1 9. A hydrodynamic torque converter as in claim 8 wherein each said
2 vane of at least the turbine wheel further comprises a second connecting element on
3 the same edge as said first connecting element, said second connecting element having
4 a second end facing away from the second end of the positioning segment, said second
5 end of said second connecting element abutting an end of a respective opening with a
6 predetermined tension.

1 10. A hydrodynamic torque converter as in claim 9 wherein said vane
2 comprises a leading flow edge and a trailing flow edge, said first connecting element
3 being adjacent to said trailing flow edge, said second connecting element being
4 adjacent to said leading flow edge.

1 11. A hydrodynamic torque converter as in claim 9 wherein the first and
2 second connecting elements lie on the outer edge, said torque converter comprising an
3 additional connecting element between the first and second connecting elements on the
4 outer edge, and a connecting element on the inner edge.

1 12. A hydrodynamic torque converter as in claim 2 comprising at least
2 three connecting elements on the outer edge and only one connecting element on the
3 inner edge.

1 13. A hydrodynamic torque converter as in claim 3 wherein said vane
2 has a radial end with a chamfer opposite to said radial end proximate to said first
3 connecting element.

1 14. A hydrodynamic torque converter as in claim 13 wherein said
2 chamfer is located at a leading flow edge of said vane.

1 15. A hydrodynamic torque converter of the type comprising a pump
2 wheel and a turbine wheel, each said wheel comprising an outer shell, an inner shell,
3 and a plurality of vanes connecting the shells, each said vane comprising an inner edge
4 facing said inner shell and an outer edge facing said outer shell, each said shell having
5 at least one opening with a length and a rear surface facing away from the vanes, each
6 said vane of at least the turbine wheel comprising:

7 a plurality of connecting elements on said edges, said elements being
8 received through respective openings in the shells and deformed against the rear
9 surfaces of the shells to fasten the vanes to the shells, at least one connecting element
10 on the inner edge comprising a pair of individual connecting segments which can be
11 separately deformed.

1 16. A hydrodynamic torque converter as in claim 15 wherein said
2 individual connecting segments of each said at least one connecting element lie in
3 planes which intersect at an angle which depends on the curvature of the vanes.

1 17. A hydrodynamic torque converter as in claim 16 wherein each said
2 opening in said inner shell which receives said connecting segments is divided in
3 sections which lie in planes which intersect at said angle.

1 18. A hydrodynamic torque converter as in claim 1 wherein, for each
2 vane, wherein the number of connecting elements received through openings in the
3 outer shell exceeds the number of connecting elements received through openings in
4 the inner shell by three.

1 19. A hydrodynamic torque converter as in claim 1 wherein each said
2 vane of at least the turbine wheel has only one connecting element received through the
3 inner shell.